Two-dimensional Spectral Analysis of SeaWiFS and Topex/Poseidon Data Supports Theory of Wave-Induced Variations of Passive Tracers

Roman E. Glazman (Jet Propulsion Laboratory, M/S 300-323, Pasadena CA, 91109, U.S.A., Email: reg@pacific.jpl.nasa.gov. Tel.: 818-354-7151, Fax: 818-393-6720),
and
Peter B. Weichman (Blackhawk Geometrics, Golden, CO 80401, U.S.A., Email: pbw@blackhawkgeo.com)

Oceanographic data on Chlorophyll concentration, SST, and SSH from satellite instruments are usually corrupted by intervening factors, such as clouds, rain cells, sampling or instrument problems, etc. Estimation of 2D wavenumber spectra from such data requires a certain ingenuity in order to take full advantage of the otherwise high intrinsic spatial resolution of satellite measurements. A statistical technique of satellite data analysis is described that overcomes most of these conventional problems and yields high resolution 2D spectra of oceanic variability. Using ungridded, gappy, irregularly spaced measurements, we estimate 2D spatial autocorrelation functions of oceanographic fields and, ultimately, obtain 2D spectra over the broadest possible spectral range. Joint analysis of T/P and SeaWiFS data is presented for selected ocean regions dominated by either quasi-geostrophic (eddy), or baroclinic-inertia-gravity (BIG) wave turbulence, or by both these types of oceanic motions. The results are analyzed in light of recently published theories of BIG wave turbulence and wave-induced variations of the passive tracer concentration field. Manifestation of semi-diurnal internal tides in the 2D spectra is particularly interesting. Comparison with previous analyses reported by Gower, Barale, Denman, Abbott, and other authors is also presented.